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ABSTRACT

The goals of the study were: (1) to determine the relationships among selected sociological, health, and behavioral variables and third-grade word analysis test scores, and (2) to test a causal model employing part analysis. Subjects were 314 Head Start students in 1968. Data on race, sex, perinatal complications, number of children in the family, father absence, and subjects' behavior were obtained from medical records. Data indicate that for the most disadvantaged children (those selected for Title I programs) the absence of the father may be a possible cause of low word analysis test scores. Data tables are included. (CS)

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The Effects of Father Absence on Word Analysis Skills

Among Head Start Children

by

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Purpose

The purpose of this paper is to determine if it is plausible to consider absence of the father from the home as a cause of the level of development of Word Analysis skills in the children. Given the background variables of sex, race, family size, and the perinatal conditions surrounding the birth of a child, this paper focuses on determining the plausibility of absence of the father as a direct cause of slow skill development and as an indirect cause through increase in serious health problems and immature behaviors. Each of the latter two variables, serious illness and immature behavior, may also exert direct effects on the level of skill development. Further, the number of serious illnesses may have an indirect effect through a link with negative behaviors.

Methodology

Educators have long wanted to be able to determine cause and effect relationships. Historically, it has been possible to calculate the correlation between two variables, but this did not permit the drawing of conclusions regarding which of the variables might be considered as the cause of the other. Neither correlation nor multiple regression--the latter essentially the determination of the correlation between one variable(s) labelled dependent and a composite variable--shed any light on the causality problem. Although even now there is no technique for proving causality, methods for disproving an erroneous assumption about a cause-effect relationship do exist. One such method--path analysis--is applied to the data in this paper.

In path analysis, it is assumed that one variable can be a cause of another if, and only if, it precedes that variable on a time line, e.g., immunization might be a cause of the number of cases of a communicable disease only if the immunization precedes the occurrence of the disease. Background

variables are assumed to produce effects in the variables being investigated for causality i.e., endogenous variables. However, no assumptions are made about causality among the background variables. Given that the background variables and the endogenous variables are plotted on a time line, paths between the variables reflect a possible causal relationship.

In the following analysis, all paths are "one way" in the direction of the time line. The earlier events are plotted to the left of the page, the later events to the right. By convention, variables are treated as causes of other variables on their right and effects of variables on their left.

The method of analysis used here is not applicable to instances of reciprocal causation, e.g., when an increase in Variable A causes an increase in Variable B, which in turn increases A, in which case the paths would form a circle.

Some paths are bigger than others, and the size of the path, referred to as the path coefficient, can be estimated using multiple regression. With all variables standardized (mean of zero and variance of one), the path coefficients are the regression coefficients of multiple regression. In path analysis, each endogenous variable, in turn, is the dependent variable. The endogenous variable(s) first on the time line is the initial dependent variable. All background variables are independent variables in the first multiple regression. In subsequent multiple regression, the dependent variable(s) is the one next encountered moving along the time line. The dependent variable from the preceding regression becomes the first independent one entered, followed by the background variables. The analysis continues in this manner until the last variable on the time line has been entered as the dependent variable.

Path Coefficients

Path coefficients indicate the relative amount of change in the dependent variable associated with a change in the independent variable, holding other variables constant. Like correlations, they obtain a maximum of 1.00 and a minimum of 0.00. Ordinarily, only paths which have statistically significant coefficients are plotted. A positive value means that an increase in the causal variable produces an increase in the effect variable. A negative sign indicates the opposite. Because the paths are standardized, two paths leading to the same variable can be compared by order of magnitude. The path with the largest value is the most important or has the greatest effect.

Paths between variables may be either direct or indirect. A direct path exists when two variables are connected by a single line unbroken by another variable. An indirect path occurs when a causal variable first leads to an effect variable and that variable, in turn, becomes a cause of a third variable. In that case, the first variable is an indirect cause of the third. Frequently, variables effect other variables both directly and indirectly. One of the advantages of path analysis is that it allows us to decompose the total effect into its direct and indirect components.

Each effect variable also has a path leading to it which is not connected to any other variable. Associated with this variable is a number called the coefficient of alienation. The coefficient of alienation indicates the ability of the causal variables to explain the effect. When the coefficient is low, it indicates that most of the variation is explained so that little is left. When it is high, it means that much remains to be explained by variables not included in the analysis.

The Sample

Path analysis was applied to two sub-groups of the Cincinnati Public Schools 1968 Head Start population: a) children who were selected for compensatory education classes, and b) children who were not selected. The first group will be referred to as Head Start Title I and the later group as Head Start non-Title I.

The Model

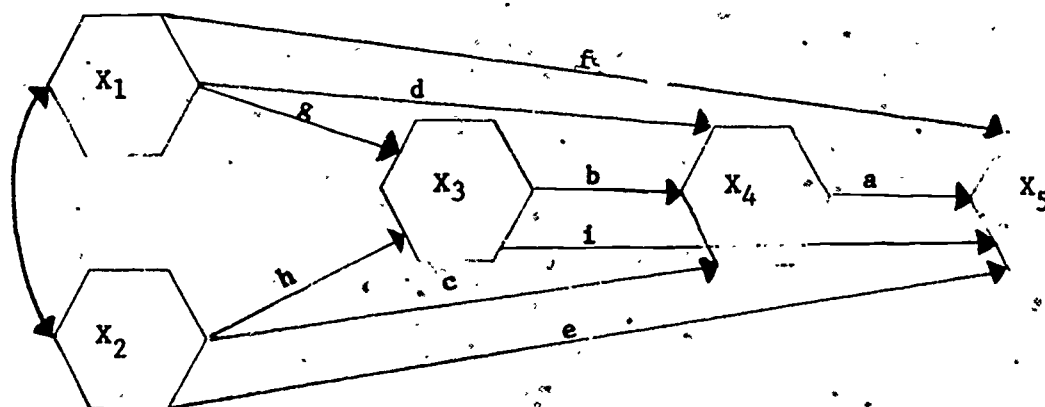
The causal model postulates four background variables; 1) race, 2) sex, 3) family size, and 4) perinatal complications surrounding the birth of the student. Endogenous variables were three: absence of the father from the home, total number of hospitalizations up to the time of entrance to the Head Start program, and certain behaviors reported by the mother and Head Start teacher. Number of hospitalizations was chosen as an indicator of the number of serious illnesses the student experienced during early childhood. An immature behavior score was determined by summing incidents of temper tantrums, nail biting, hyperactivity, fighting, jealousy, refusal to mind, short attention span, and school absence.

The medical records made at entrance to the Head Start program were one source of data, teacher referrals were another. The Word Analysis test score was from the Metropolitan Achievement Test, third grade, correlation coefficients and path coefficients.

The correlation between endogenous variables or between an endogenous variable and a background variable may be regarded as the sum of three effects: 1) direct effects, 2) indirect effects, and 3) joint or spurious effects. The direct effect is equal to the coefficient of the path that passes uninterrupted between the two variables. To calculate the indirect effects, 1) determine all

possible "trails" between the two variables that pass through a third, fourth, etc., variable, 2) find the product of the path coefficients on each trail, and finally, c) sum the product(s).

The joint or spurious effects are the correlation coefficient minus the sum of the direct and indirect effects. In the diagram, the correlation between X_5 and X_2 ($r_{2,5}$) can be expressed as:



Direct Effect

e

Indirect Effect

(a)(b)(h) + (a)(c) + (i)(h)

Joint or Spurious

$r_{2,5}$ minus sum of direct and indirect effects

The two headed arrows between the background variables X_1 and X_2 indicate correlations not path coefficients.

Results

Among Title I students (Figure 1), absence of the father had a direct negative effect on word analysis skills (-.36). Unexpectedly, it also had a small positive indirect effect (Table 1) through immature behavior. Family size also had mildly depressing effect on Word Analysis scores, but this effect was not as significant as that of father absence. About 16 percent of the variability in Word Analysis scores was accounted for by the model. Among non-Title I students (Figure 2), only family size had any effect on Word

Figure 1. Head Start Title I Students

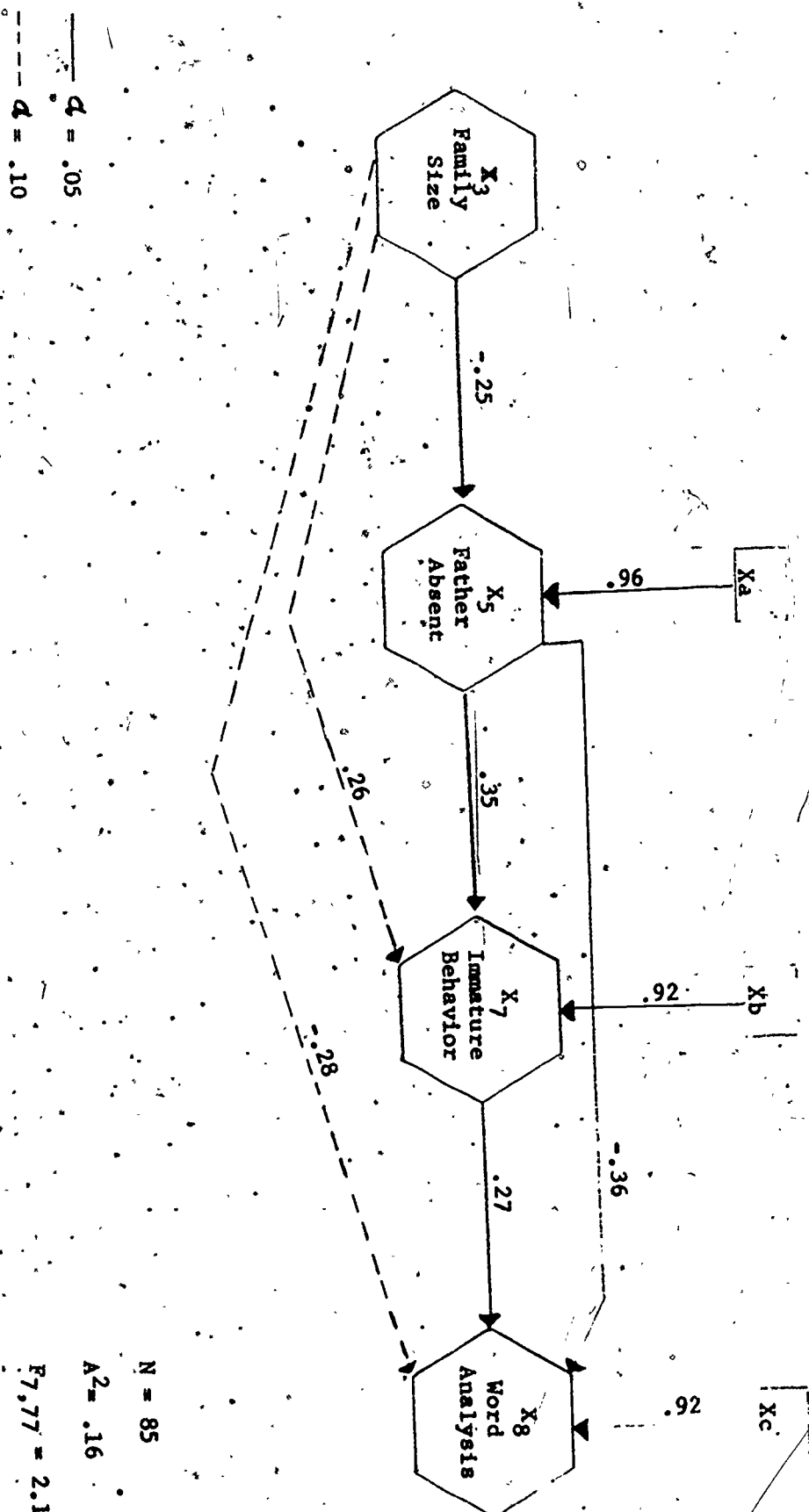


Table 1. Head Start Non-Title I Students

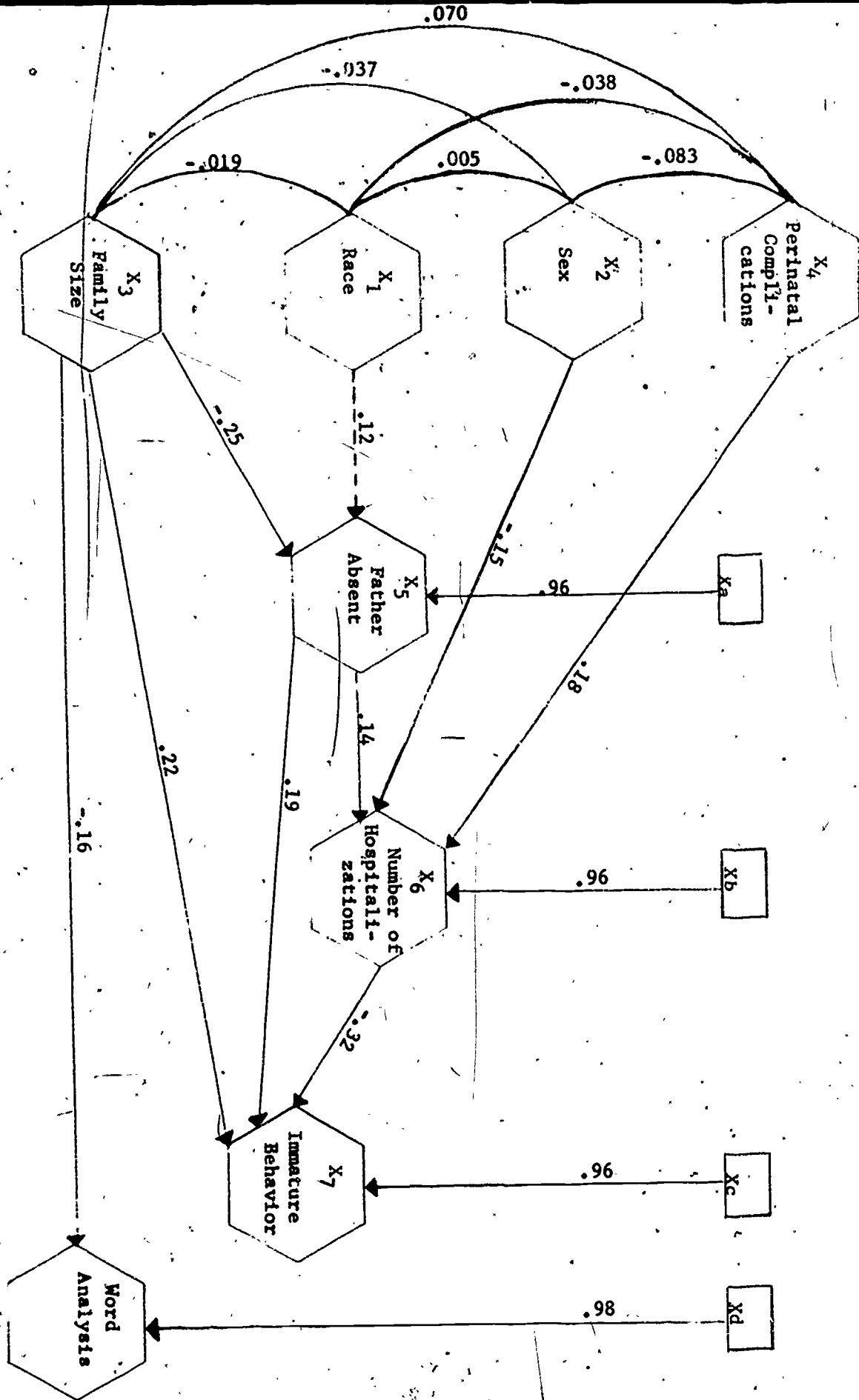
	Correlation with Word Analysis				Joint or Spurious	Correlation with Word Analysis				Joint or Spurious
	Direct	Effects	Indirect			Direct	Effects	Indirect		
Immature Behavior	-.0600	-.0184	—	—	-.0416	.1105	.2666	—	—	-.1561
Number of Hospital	-.1117	-.0924	.0006	—	-.0199	.0712	.1203	-.0047	—	-.0444
Father Absent	-.0490	-.0839	.0166	—	.0183	-.1951	-.3638	.1045	—	.0642
Perinatal Complications	-.0700	-.0410	-.0168	—	-.0122	.0120	-.1022	.0446	—	.0696
Family Size	-.1493	-.1640	.0198	—	-.0051	.0081	-.2792	.0763	—	.2110
Sex	.0227	.0000	.0126	—	.0101	.1490	.0493	-.0368	—	.1365
Race	.0364	.0399	-.0175	—	.0140	.1234	.0574	-.0259	—	.0919

Head Start Title I Students

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Figure 2. Head Start Non-Title I

N = 228

 $R^2 = .04$ $F_{6,221} = 1.71$

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Analysis skills, and the effect was small. A very small percent of the variation in Word Analysis scores was accounted for by this among the non-Title I group. Neither race nor sex had any effect on Word Analysis skills in either group.

Conclusions

This analysis indicated that a different mechanism operates in the most disadvantaged group (Title I). Among the less disadvantaged, it could not be shown that father absence had either direct or indirect effects on Word Analysis skills development. However, absence of the father may be considered as a possible cause of low scores among the most disadvantaged until demonstrated otherwise.

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Table 2. Multiple Correlation and Beta Coefficients

Dependent Variable	Independent Variable	Non-Title I		Title I	
		Beta Coefficient	"F" Value	Beta Coefficient	"F" Value
X ₈ Word Analysis	X ₇ Negative Behavior	-.0184	0.07	.2666	5.49
	X ₆ No. of Hospitalizations	-.0924	1.86	.1203	1.24
	X ₅ Father Absence	-.0839	1.42	-.3638	9.77
	X ₄ Perinatal Complications	-.0410	0.37	-.1022	0.91
	X ₃ Family Size	-.1640	5.52	-.2792	6.19
	X ₂ Sex	-----	0.00	.493	0.22
	X ₁ Race	.0399	0.36	.0574	0.30
		(R ² = .04)		(R ² = .16)	
X ₇ Immature Behavior	X ₆ No. of Hospitalizations	-.0324	0.23	-.0178	0.03
	X ₅ Father	.1920	7.97	.3514	10.44
	X ₄ Perinatal Complications	.0736	1.24	.0733	0.48
	X ₃ Family Size	.2217	10.97	.2619	5.92
	X ₂ Sex	-.0548	.70	-.0558	0.28
	X ₁ Race	-.0602	0.85	-.0413	0.16
		(R ² = .08)		(R ² = .16)	
X ₆ No. of Hospitalizations	X ₅ Father Absence	.1413	4.42	.0939	0.74
	X ₄ Perinatal Complications	.1836	8.01	.1830	2.85
	X ₃ Family Size	.0136	0.04	-----	0.00
	X ₂ Sex	-.1473	5.18	-.1464	1.83
	X ₁ Race	-.0530	0.67	-.0473	0.19
		(R ² = .08)		(R ² = .07)	
X ₅ Father Absence	X ₄ Perinatal Complications	-.0150	.05	-.0150	0.02
	X ₃ Family Size	-.2504	15.11	-.0250	5.42
	X ₂ Sex	.0194	0.09	.0194	0.03
	X ₁ Race	.1215	3.58	.1215	1.28
		(R ² = .08)		(R ² = .08)	

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